
LDAS Components

LDAS is a suite of Linux data analysis tools, comprised of:

- **Programs** (xe-): executables (compiled C) which do the “heavy lifting” of things like mathematical calculations and signal processing.
- **Scripts** (xs-): executable shell (BASH) scripts which invoke and link multiple programs to do complex jobs and manage file-system operations.
- **Functions** (xf_): C-language components of programs which do specific jobs, and are used in multiple programs.

This guide is generated by the **xs-progtag** tool, which makes use of the **<TAGS>** label in the LDAS source code. Tags in the code indicate the categories the code belongs to - for example statistics, or plotting. These categories are entered when the code is created, and are subject to change.

The rest of this guide is divided into three sections:

- **CATEGORIES**
 - **CATEGORICAL CODE-LINKS**
 - **CODE**
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^ CATEGORIES

LDAS uses tags to help you find code to perform particular tasks. A given script, program or function may have multiple tags, as they may have overlapping functions. This is a list of every category-tag found in the LDAS code:

database detect electrophysiology file filter ldas math matrix MEA misc noise
O2 plot programming screen signal__processing slice spectra spikes stats string
synthetic__data taini time transform

files

database: working with database tables
screen: extract subsets of data
file: reading and converting files of different formats
matrix: working with 2D matrices of numbers

describe data

detect: detect events, features, etc. in a signal
math: get descriptive values (cartesian, means, etc.)
stats: calculating summary statistics for data
spectra: FFT-based timeseries analysis (spectral power, coherence, PAC etc)

transform data

transform:
signal_processing: transformation of a series (filter,bin,rectify, etc.)
filter: for removing components of a signal
time: working with time-series, timestamps, dates, etc
noise: removing noise from data

miscellaneous

misc:
plot: generate, modify or transform postscript plots
programming: development tools for LDAS
spikes: analysis of discrete events like action-potentials
string: character-string detecting and processing
electrophysiology:
synthetic_data: create numbers, datasets, timestamps etc.

platform-specific

O2: for oxygen-amperometry experiments
slice: for slice electrophysiology experiments
mea: for slice multi-electrode-array electrophysiology
ldas: code assuming an LDAS data structure and folder contents
taini:

^ CATEGORICAL CODE-LINKS

This section provides links to any code containing one or more of the possible category-tags. The links are organised in one column for each of scripts, programs, and functions.

^ CATEGORY: database

Scripts	Programs	Functions
xs-batch1	xe-cut1	xf_getheader1
xs-checkkeys	xe-cut2	xf_linereadblock1
xs-collate1	xe-dbmatch1	xf_strkey1
xs-collect1	xe-dbmatch2	
xs-dbcheck1	xe-getkey2	
xs-dbcomp1	xe-getkey	
xs-dbmake1	xe-getkeycol	
xs-dbmatch1	xe-getkeyline1	
xs-dbmatch2	xe-getsequence1	
xs-getgroupnames1	xe-keyupdate1	
xs-getheader	xe-matchlist	
xs-ldas5-gettrials1	xe-matchtimes1	
xs-ldas5-gettrials2	xe-matchtimes2	
xs-ldas5-XSERIES1b	xe-stripcomments	
xs-ldas-updatenotes		
xs-ldas-updatenotes2		
xs-makelink1		
xs-plotcollate		

^ CATEGORY: detect

Programs

xe-curveinflect1

^ CATEGORY: electrophysiology

Scripts

xs-TAINI-hargreaves0
 xs-TAINI-laser0
 xs-TAINI-legacy0
 xs-TAINI-legacy1
 xs-TAINI-legacy2
 xs-TAINI-legacy3
 xs-TAINI-preproc1

^ CATEGORY: file

Scripts	Programs	Functions
xs-dat2bin	xe-axona2dat	xf_filesize
xs-ldas-killbadchans1	xe-cut2	xf_getheader1
xs-ldas-zipexpt	xe-dbmatch1	xf_lineparse1
xs-makelink1	xe-elp-readscore1	xf_lineparse2
xs-MEA-hdf5	xe-filesize1	xf_lineread1
xs-rega	xe-ldas5-screentxt1	xf_linereadblock1
xs-rega2	xe-O2-readchart2	xf_matrixread1_d
xs-rename	xe-O2-readmed1	xf_matrixread2_d
xs-renamespace	xe-O2-readmed2	xf_matrixread3_d
xs-strsub	xe-readbinary1	xf_readbin1_d
xs-strsubfile	xe-readbinary2	xf_readbin1_f
	xe-readbinary3	xf_readbin1_i
	xe-readscore1	xf_readbin1_l
	xe-readscore2	xf_readbin1_s
	xe-repeated1	xf_readbin1_v
	xe-splitfile1	xf_readbin2_f
	xe-transpose1	xf_readbin2_i
	xe-transpose2	xf_readbin2_v
	xe-winsplit1	xf_readbin3_v
	xe-writebinary1	xf_readbinx1
		xf_readclub1
		xf_readscore1
		xf_readscore_raw1
		xf_readssp1
		xf_readwave1_f
		xf_readwinltp1_f
		xf_readxyd1
		xf_writebin1_v
		xf_writebin2_v
		xf_writebinx1
		xf_writewave1_f

^ CATEGORY: filter

Programs

xe-checkisnum2
xe-cut2
xe-demean1
xe-detrend1
xe-fftflt1
xe-filter_butterworth1
xe-filter_clip1
xe-filter_FIR1
xe-filter_notch1
xe-getintervals1
xe-interp1
xe-interpspectrum1
xe-matchlist
xe-matchtimes1
xe-matchtimes2
xe-oversample1
xe-smoothbox1
xe-smoothgauss1
xe-trimoutliers1

Functions

xf_bin1a_d
xf_bin1a_f
xf_bin1b_d
xf_bin1b_f
xf_bin1b_s
xf_bin2_d
xf_binpeak1_f
xf_binpeak4
xf_dejump2_f
xf_demean1_d
xf_demean1_f
xf_demean1_s
xf_detrend1_d
xf_detrend1_f
xf_filter_bworth1_d
xf_filter_bworth1_f
xf_filter_bworth2_f

xf_filter_bworth_matrix1_d
 xf_filter_clip1_f
 xf_filter_FIRapply1_f
 xf_filter_FIRapply1_s
 xf_filter_FIRapply2_f
 xf_filter_FIRcoef1
 xf_filter_mingood2_f
 xf_filter_mingood2_s
 xf_filter_notch1_f
 xf_filter_notch2_f
 xf_fishertransform2_d
 xf_fishertransformrev2_d
 xf_interp3_d
 xf_interp3_f
 xf_interp3max_f
 xf_interp4_d
 xf_interp4_f
 xf_interp4_s
 xf_matrixbin1_d
 xf_matrixcontig1_l
 xf_matrixresample1_d
 xf_screen_club
 xf_screen_lf
 xf_screen_ls
 xf_screen_ssp1
 xf_screen_ssp2
 xf_screen_xyd
 xf_smooth2d_gaussd
 xf_smoothbox1_d
 xf_smoothbox1_f
 xf_smoothbox2_d
 xf_smoothbox2_f
 xf_smoothgauss0_d
 xf_smoothgauss0_f
 xf_smoothgauss1_d
 xf_smoothgauss1_f
 xf_smoothgauss2_d
 xf_smoothgaussd
 xf_wavefilt1_f

^ CATEGORY: ldas

Scripts

xs-dat2bin
xs-getgroupnames1
xs-ldas-getchannel
xs-ldas-killbadchans1
xs-ldas-parsename
xs-ldas-trials2cmt
xs-ldas-updatenotes
xs-ldas-updatenotes2
xs-ldas-XLASER1
xs-ldas-zipexpt
xs-manual

^ CATEGORY: math

Scripts	Programs	Functions
xs-autocor	xe-convolve1	xf_compare1_d
xs-dbcomp1	xe-distvel3	xf_compare1_f
xs-getmedian1	xe-getdelta1	xf_compare1_l
xs-plotcor2	xe-getdelta2	xf_conv1_f
xs-plotmeans1	xe-getsamplefreq1	xf_conv2_f
xs-plotmeans2	xe-math_abs1	xf_geom_angle1_f
xs-plotmeans3	xe-math_add1	xf_geom_dist1
	xe-math_div1	xf_geom_distangle
	xe-math_doublet	xf_geom_linear1_f
	xe-math_index1	xf_geom_offset1_d
	xe-math_mult1	xf_geom_offset1_f
	xe-math_power1	xf_geom_slope2_f
	xe-math_round1	xf_getindex1_d
	xe-math_round2	xf_mae1_f
	xe-math_sum1	xf_matrixavg1_d
	xe-matrixavg2	xf_matrixavg1_f
	xe-matrixdiff1	xf_precision_c
	xe-matrixsub1	xf_precision_d
	xe-random1	xf_qsortindex1_f
	xe-statscol1	xf_qsortindex1_l
	xe-statsd1	xf_qsortindex1_s
	xe-statsgrp0	xf_rms1_d
	xe-statsgrp1	xf_rms1_f
	xe-statsgrp2	xf_rms2_d
	xe-statsgrp3	xf_rms2_f
	xe-statsrow1	xf_round1_d
	xe-test1	xf_round1_f
	xe-transpose4	xf_round2_d
	xe-wint1	xf_trimdigits_d
		xf_velocity1

^ CATEGORY: matrix

Scripts	Programs	Functions
xs-plotmatrixsplit1	xe-matrixavg2	xf_densitymatrix1_l
	xe-matrixcut1	xf_densitymatrix2_l
	xe-matrixcut2	xf_filter_bworth_matrix1_d
	xe-matrixcut2_inprogress	xf_matrixavg1_d
	xe-matrixdiff1	xf_matrixavg1_f
	xe-matrixmod1	xf_matrixbin1_d
	xe-matrixpeak1	xf_matrixcoh1_d
	xe-matrixsplit1	xf_matrixcontig1_l
	xe-matrixstats1	xf_matrixexpand1_d
	xe-matrixsub1	xf_matrixflipx_d
	xe-mxcor2	xf_matrixflipy_d
	xe-plotmatrix1	xf_matrixpeak1_d
	xe-spectdenoise1	xf_matrixread1_d
		xf_matrixread2_d
		xf_matrixread3_d
		xf_matrixresample1_d
		xf_matrixrotate1_d
		xf_matrixrotate1_f
		xf_matrixrotate2_d
		xf_matrixtrans1_d
		xf_mullerize_d10
		xf_placeinfo1_l
		xf_placestats1_d
		xf_spectdenoise1_d

^ CATEGORY: MEA

Scripts

xs-MEA-amp1
xs-MEA-detect1
xs-MEA-detect2
xs-MEA-detect2b
xs-MEA-detect3
xs-MEA-hdf5
xs-MEA-merge1
xs-MEA-plotflip
xs-MEA-pow1
xs-MEA-rate1
xs-MEA-rate1b
xs-MEA-xcor1

^ CATEGORY: misc

Functions

xf_pause1
xf_rollbuffer1_f

^ CATEGORY: noise

Programs

xe-matrixavg2
xe-spectdenoise1

^ CATEGORY: O2

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Scripts	Programs
xs-O2-plot1	xe-O2-readchart2
xs-O2-plot1b	xe-O2-readmed1
xs-O2-plotaligned2	xe-O2-readmed2
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^ CATEGORY: plot

Scripts

xs-ldas5-plotdata1
xs-ldas5-plothist1
xs-ldas5-plothistwave1
xs-ldas5-plotplace1
xs-ldas5-plotthetadelta1
xs-ldas5-plotwave1
xs-MEA-plotflip
xs-O2-plot1
xs-O2-plot1b
xs-O2-plotaligned2
xs-plotbydate
xs-plotcollate
xs-plotcolours
xs-plotconvert1
xs-plotcor2
xs-plotmatrixsplit1
xs-plotmeans1
xs-plotmeans2
xs-plotmeans3
xs-plotmod1
xs-plotmodlegend
xs-plotmodtics
xs-plotsignal
xs-plotsubgrptime
xs-rega
xs-rega2
xs-TAINI-tools

Programs

xe-plotmatrix1
xe-plotmerge1
xe-plotmerge2
xe-plottable1

^ CATEGORY: programming

Scripts	Programs	Functions
xs-ldas5-packet2b	xe-progdep	xf_err1
xs-ldas5-XHAR2	xe-sizes1	xf_template
xs-ldas-trials2cmt	xe-template	
xs-manual		
xs-paste1		
xs-plotcolours		
xs-progbackup2		
xs-progclean1		
xs-progcompile		
xs-progdep		
xs-progfindcopies		
xs-proggit1		
xs-progheader1		
xs-proginstall		
xs-proglicence		
xs-proglist		
xs-progpath1		
xs-progpermission		
xs-progps		
xs-progsync1		
xs-progtag		
xs-template		

^ **CATEGORY: screen**

Programs

xe-cut1
xe-ldas5-screentxt1
xe-math_index1
xe-repeated1
xe-splitfile1

^ **CATEGORY: signal_processing**

Scripts

xs-autocor
 xs-crunch2
 xs-ldas5-coh1
 xs-ldas5-pow1
 xs-ldas5-XHAR1
 xs-ldas5-XHAR1b
 xs-ldas-XLASER1
 xs-noise1
 xs-plotsignal
 xs-thetadelta1

Programs

xe-autocor1
 xe-axona2dat
 xe-bin1
 xe-bin2
 xe-cofiring1
 xe-convolve1
 xe-csd1
 xe-curveinflect1
 xe-curvestats1
 xe-curvestats2
 xe-decimate1
 xe-demean1
 xe-density1
 xe-densitymatrix1
 xe-detectcycles2
 xe-detectevents1
 xe-detectnoise1
 xe-detectsync1
 xe-detrend1
 xe-distvel3
 xe-elp-readscore1
 xe-energyvec1
 xe-energyvec2
 xe-fftcoh3
 xe-fftfilt1
 xe-fftpow1
 xe-fftpow2
 xe-filter_butterworth1
 xe-filter_clip1
 xe-filter_FIR1
 xe-filter_notch1
 xe-getsamplefreq1
 xe-hist1
 xe-interp1
 xe-interpspectrum1
 xe-ldas5-packetloss2
 xe-ldas5-packetloss3
 xe-lombscargle1
 xe-matrixmod1
 xe-matrixsplit1
 xe-mxcor2
 xe-oversample1
 xe-pac2
 xe-pad1
 xe-rms2
 xe-smoothbox1
 xe-smoothgauss1¹³
 xe-spectdenoise1
 xe-timestamp1
 xe-timestamp2
 xe-trimoutliers1
 xe-winsplit1
 xe-wint1

Functions

xf_bin1a_d
 xf_bin1a_f
 xf_bin1b_d
 xf_bin1b_f
 xf_bin1b_s
 xf_bin2_d
 xf_binpeak1_f
 xf_binpeak4
 xf_blockrealign1_ls
 xf_blockrealign2
 xf_conv1_f
 xf_conv2_f
 xf_decimate_f
 xf_decimate_s
 xf_dejump2_f
 xf_demean1_d
 xf_demean1_f
 xf_demean1_s
 xf_density1_l
 xf_density2_l
 xf_densitymatrix1_l
 xf_densitymatrix2_l
 xf_detectcycles2_f
 xf_detectevents1_f
 xf_detectevents2_f
 xf_detectevents3_lf
 xf_detectinflect1_f
 xf_detrend1_d
 xf_detrend1_f
 xf_eventadjust1_f
 xf_expand1_d
 xf_expand1_f
 xf_fillinterp_itime
 xf_fillinterp_lf
 xf_filter_bworth1_d
 xf_filter_bworth1_f
 xf_filter_bworth2_f
 xf_filter_bworth_matrix1_d
 xf_filter_clip1_f
 xf_filter_FIRapply1_f
 xf_filter_FIRapply1_s
 xf_filter_FIRapply2_f
 xf_filter_FIRcoef1
 xf_filter_mingood2_f
 xf_filter_mingood2_s
 xf_filter_notch1_f
 xf_filter_notch2_f
 xf_fishertransform2_d
 xf_fishertransformrev2_d
 xf_histburst1_d
 xf_histratio1_d
 xf_histratio2_d
 xf_histrefract1_d
 xf_histtheta1d
 xf_interp3_d

^ **CATEGORY:** slice

Functions

xf_readwinltp1_f

^ **CATEGORY:** spectra

Scripts	Programs	Functions
xs-ldas5-coh1	xe-fftcOH3	xf_spectdenoise1_d
xs-ldas5-pow1	xe-fftpow1	
xs-ldas5-XHAR1	xe-fftpow2	
xs-ldas5-XHAR1b	xe-spectdenoise1	

^ **CATEGORY:** spikes

Programs

xe-cofiring1
xe-ldas5-cluhist1
xe-ldas5-clurate1
xe-ldas5-clusort1
xe-ldas5-cofiring1
xe-ldas5-placefields1
xe-ldas5-placestats1
xe-ldas5-readclub1

^ **CATEGORY:** stats

Programs

xe-autocor1
xe-bin1
xe-bin2
xe-cor1
xe-cor3
xe-correlate
xe-curvestats1

xe-curvestats2
xe-hist1
xe-histstats1
xe-lombscargle1
xe-norm2
xe-norm3
xe-normrow2
xe-posstats1
xe-rms2
xe-spearman1
xe-statscol1
xe-statsd1
xe-statsgrp0
xe-statsgrp1
xe-statsgrp2
xe-statsgrp3
xe-statsrow1
xe-transpose4

Functions

xf_auc1_d
xf_auc1_f
xf_auc2_d
xf_auc2_f
xf_correlate
xf_correlate_d
xf_correlate_f
xf_correlate_i
xf_correlate_l
xf_correlate_simple_d
xf_correlate_simple_f
xf_correlate_simple_i
xf_correlate_simple_l
xf_crit_T1
xf_curvestats1_d
xf_curvestats2_d
xf_curvestats3_f
xf_density1_l
xf_density2_l
xf_densitymatrix1_l
xf_densitymatrix2_l
xf_detectinfect1_f
xf_hist1d

xf_hist1_l
xf_histburst1_d
xf_histratio1_d
xf_histratio2_d
xf_histrefract1_d
xf_histtheta1d
xf_mae1_f
xf_morletwavelet1_f
xf_morletwavelet2_f
xf_mtm_F
xf_mtm_slepian1
xf_mtm_spectavg1
xf_mullerize_d10
xf_norm1_d
xf_norm2_d
xf_norm2_f
xf_norm3_d
xf_percentile1_d
xf_percentile1_f
xf_placeinfo1_l
xf_placestats1_d
xf_power_goertzel1_d
xf_power_goertzel1_f
xf_power_goertzel2_d
xf_power_goertzel2_f
xf_prob_F
xf_prob_T1
xf_rms1_d
xf_rms1_f
xf_rms2_d
xf_rms2_f
xf_spearmans1_f
xf_stats1_d
xf_stats2_d
xf_stats2_f
xf_stats3_d
xf_stats3_f
xf_ttest2_d
xf_ttest3_d
xf_wavector1_f
xf_wavector2_f
xf_wavepeak1_f
xf_wavepeak2_f
xf_wavewidth3_f
xf_wint1
xf_wint1_ls

xf_wint2_di
xf_wint3_ls

^ **CATEGORY: string**

Scripts	Programs	Functions
xs-checkkeys	xe-checkisnum2	xf_dateconv1
xs-las-parsename	xe-dateconv1	xf_datemod1
xs-las-updatenotes	xe-dbmatch1	xf_dateparse1
xs-las-updatenotes2	xe-delimit	xf_linecomment1
xs-match	xe-delimitkiller	xf_lineparse1
xs-rename	xe-getsequence1	xf_lineparse2
xs-renamespace	xe-insert1	xf_lineread1
xs-strsub	xe-makepairs1	xf_parselist1_1
xs-strsubfile	xe-strgroup1	xf_strcat1
	xe-stripcomments	xf_strcut1
	xe-strsub1	xf_strescape1
	xe-strsub2	xf_strkey1
	xe-strxmlparse1	xf_strncat1
	xe-timeconv1	xf_strstr1
		xf_strsub1
		xf_strtod1

^ **CATEGORY: synthetic_data**

Scripts	Programs	Functions
xs-makesignal1	xe-makedata1	xf_rand1_d
xs-makesignal2	xe-makedata2	
	xe-random1	
	xe-timestamp2	

^ **CATEGORY: taini**

Scripts

xs-ldas5-XHAR1
xs-ldas5-XHAR1b
xs-ldas5-XHAR3
xs-ldas5-XLASER1
xs-TAINI-hargreaves0
xs-TAINI-laser0
xs-TAINI-legacy0
xs-TAINI-legacy1
xs-TAINI-legacy2
xs-TAINI-legacy3
xs-TAINI-preproc1
xs-TAINI-tools

^ CATEGORY: time

Scripts	Programs	Functions
xs-ldas5-gettrials1	xe-dateconv1	xf_blockrealign1_ls
xs-ldas5-gettrials2	xe-filesize1	xf_blockrealign2
xs-plotbydate	xe-getintervals1	xf_dateparse1
	xe-ldas5-packetloss2	xf_density1_l
	xe-ldas5-packetloss3	xf_density2_l
	xe-ldas5-readssp1	xf_samplefreq1_d
	xe-ldas5-screentxt1	xf_screen_club
		xf_screen_lf
		xf_screen_ls
		xf_screen_ssp1
		xf_screen_ssp2
		xf_sspsplit1_l
		xf_window1_l
		xf_wint1
		xf_wint1_ls
		xf_wint2_di
		xf_wint3_ls

^ CATEGORY: transform

Programs

xe-transpose3

Functions

xf_expand1_f
xf_matrixexpand1_d